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(21) International Application Number: PCT/US99/29450 (22) International Filing Date: 13 December 1999 (13.12.99) (30) Priority Data: 09/240,391 29 January 1999 (29.01.99) US (71) Applicant (for all designated States except US): AVON PRODUCTIONS, INC. [US/US]; 1251 Avenue of the Americas, New York, NY 10020-1196 (US). (72) Inventors; and (75) Inventors/Applicants (for US only): SCHICK, Laura, A. [US/US]; 326 Sunrise Drive, Newburgh, NY 12550 (US). SANCHEZ, Claudia, P. [CO/US]; 355 Shea Drive, New Milford, NJ 07646 (US). (74) Agent: RUGGIERO, Charles, N., J.; Ohlandt, Greeley, Ruggiero & Perle, L.L.P., 9th floor, One Landmark Square, Stamford, CT 06901-2682 (US).		(81) Designated States: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG). Published <i>With international search report.</i>
(54) Title: HEAT SAFE HAIR CARE COMPOSITION AND METHOD OF PROTECTING HAIR FROM HEAT TREATMENT		
(57) Abstract <p>The present invention relates to a hair care composition that protects hair from heat comprising: (i) an ester of dimethicone copolyol; (ii) a silanol-terminated copolymer; and (iii) a cosmetically acceptable carrier. In addition, the present invention also contemplates a method of protecting hair from heat comprising the step of contacting hair with the hair care composition described above.</p>		

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HEAT SAFE HAIR CARE COMPOSITION AND METHOD OF PROTECTING HAIR FROM HEAT TREATMENT

Field of the Invention

5 The present invention relates generally to hair care compositions. More particularly, the present invention relates to hair care compositions for pre-treatment of hair before heating and styling.

Background of the Invention

10 Heat styling, such as the use of a blow dryer or curling device to heat hair during styling, is prevalent amongst consumers. Unfortunately, heat styling can dry out and damage hair if the hair is subject to too much heat. For example, a person can overdry hair by holding a blow dryer too close to the hair or can overdry hair by holding a blow dryer or curling
15 device too long at a particular spot of the hair. Moisture will be driven out of the hair so that the hair will become brittle and more susceptible to cracking. Such hair has heat dryout.

 In addition, such heat styling can also cause physical damage to hair. For example, during such heat styling, the hair is brushed or combed.
20 The constant rubbing and wear to the outer surface of the hair, leads to cracks and breaks in the hair. Moreover, dry hair, particularly dry hair suffering from heat dryout, is particularly susceptible to such physical damage.

 Hair fibers whose cuticles are damaged by thermal cracking undergo
25 high levels of cuticle abrasion upon combing. Long-term effects of cuticle abrasion are noticeable at hair tips in the form of "split ends". In addition, the cumulative effects of cuticle removal due to thermal cracking results in hair with no cuticular envelope, thereby causing brittleness. Consequentially, protecting hair against thermal cracking results in split end
30 prevention and reduction in hair brittleness.

 Accordingly, it is an object of the present invention to provide a hair care composition that prevents physical damage due to heat treatment of hair such as with a blow dryer or a curling iron.

It is another object of the present invention to provide a hair care composition that prevents physical damage by heat styling of hair such as brushing and combing that typical accompanies the process of heat treating hair.

- 5 It is a further object of the present invention to provide a hair care composition that controls moisture, prevents split ends and reduces hair brittleness.

SUMMARY OF THE INVENTION

10 The present invention relates to a hair care composition comprising:

- (i) an ester of dimethicone copolyol;
- (ii) a silanol-terminated copolymer; and
- (iii) a cosmetically acceptable carrier.

15 The inventors have discovered that when esters of dimethicone copolyol and a silanol-terminated copolymer are admixed into a hair care composition, the mixture provides an excellent degree of thermal protection for hair.

In addition, the present invention also contemplates a method of
20 protecting hair from heat comprising the steps of contacting hair with the hair care composition described above.

DETAILED DESCRIPTION OF THE INVENTION

The present invention is a hair care composition that is applied to
25 hair before heat styling. In particular, the hair care composition is applied before subjecting the hair to heat treatment or styling, such as blow drying or heat curling. Preferably, the hair care composition is applied to the hair after the use of cleaning compositions, such a shampoo and a conditioner, so that such cleaning compositions do not wash away the hair care
30 composition. It is also preferred that the hair care composition be applied before the application of general styling products to ensure direct contact to the hair.

The components of the hair care composition comprises: (i) an ester of dimethicone copolyol; (ii) a silanol-terminated copolymer; and (iii) a cosmetically acceptable carrier.

The first class of components are esters of dimethicone copolyol.

5 The term "dimethicone copolyol" is the Cosmetic, Toiletry, and Fragrance Association (CFTA) designation for certain polysiloxanes polyether copolymers. The esters of dimethicone copolyol are partial esters of dimethicone copolyol. For the present invention, the dimethicone copolyols are preferably esterified by fatty acids.

10 Examples of preferred esters of dimethicone copolyols are dimethicone copolyol behenate, dimethicone copolyol almondate, dimethicone copolyol avocadoate, dimethicone copolyol beeswax, dimethicone copolyol borageate, dimethicone copolyol cocoa butterate, dimethicone copolyol dhupa butterate, dimethicone copolyol
15 hydroxysterate, dimethicone copolyol isosterate, dimethicone copolyol kokum butterate, dimethicone copolyol laurate, dimethicone copolyol mango butterate, dimethicone copolyol meadowfoamate, dimethicone copolyol mohwa butterate, dimethicone copolyol octyl dodecyl citrate, dimethicone copolyol olivate, dimethicone copolyol sal butterate,
20 dimethicone copolyol shea butterate, and dimethicone copolyol stearate. The more preferred ester of dimethicone copolyol is dimethicone copolyol meadowfoamate.

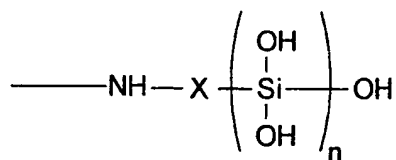
These esters are commercially available and described in the "International Cosmetic Ingredient Dictionary and Handbook" Seventh
25 Edition, 1997.

The amount of the dimethicone copolyol ester is present in an amount from about 0.1 to about 5%, preferably about 0.2 to about 3% and more preferably about 0.5 to about 1.5% based on the total weight of the composition.

30 The second component in the hair care composition is a silanol-terminated copolymer. The silanol-terminated copolymer comprises a

polymer backbone with a silanol-terminated sidechain. A general structure of the silanol terminated copolymer is shown below:

Polymer chain



5

wherein X is an alkyl or alkoxy and n is an integer from 1 to 3.

The polymer backbone is preferably a polypeptide derived from hydrolyzed proteins. The term "hydrolyzed protein," as used herein, refers to the product of the hydrolysis of homogeneous or heterogeneous proteins, or their respective components, derivatives or combinations thereof, from sources including, but not limited to, plants and their respective components, seeds, animal bones, connective tissue, animal keratin, bovine and porcine collagen, human hair, wool, silk, elastin, reticulin, milk, egg, wheat, corn, soy, oats, casein, albumin, or any collagenous or keratinic substance, or derivatives thereof. The preferred protein sources include keratin, soy, milk, collagen, wheat and their respective components, derivatives or combinations thereof. The more preferred polypeptides are derived from wheat proteins.

The compositions of the present invention are not limited to hydrolyzed proteins produced from naturally occurring proteins. Synthetic proteins, peptides, or amino acids as well as naturally occurring proteins, peptides or amino acids or mixtures of naturally occurring and synthetic proteins and/or peptides and/or amino acids may also be used according to the invention. Hydrolyzed protein prepared from various proteins, their respective components, and derivatives may be combined and used in the composition of the present invention. Moreover, a hydrolyzed protein may

be supplemented by the addition of one or more natural or synthetic peptides or amino acids.

Methods for producing hydrolyzed proteins from the above-mentioned protein sources include, but are not limited to: 1) acid hydrolysis; 5 2) alkali hydrolysis; and 3) enzyme hydrolysis using a suitable protease. These methods, along with several others, for preparing hydrolyzed proteins are well known in the art. Further, hydrolyzed proteins suitable for the compositions of the present invention are commercially available.

Hydrolyzed proteins typically have a number average molecular 10 weight from about two hundred to several hundred thousand depending on the nature of the protein and/or the extent of hydrolysis. Preferably the number average molecular weight of the hydrolyzed protein is from about 100 to 100,000, preferably from about 100 to 20,000 more preferably from about 100 to 10,000, and even more preferably from about 100 to 5,000.

15 The silanol-terminated copolymer is formed by covalently attaching an organofunctional silicone/silane compound to the terminal or side chain functional group of a polymer backbone. With respect to hydrolyzed protein, the organofunctional silicone/silane compound is covalently attached to the terminal or side chain amino group of the hydrolyzed 20 protein by an amino reactive group such as epoxy, esters, haloalkyl and the like.

The silanol terminated copolymer may further comprise cross-linked groups. Cross-linking involves the formation of functional siloxane links between two polymer backbone chains and occurs through a mechanism in 25 which the terminal silanol (Si-OH) of one polymer condenses with a terminal silanol of another polymer forming a siloxane (Si-O-Si) bond and water.

The most preferred silanol-terminated copolymer is hydrolyzed wheat protein hydroxypropyl polysiloxane. This silanol-terminated 30 copolymer is available from Croda, Inc. Parsippany N.J.

The amount of the silanol terminated copolymer is present in an amount from about 0.01 to about 5%, preferably about 0.1 to about 3% and

more preferably about 0.1 to about 1% based on the total weight of the composition.

The composition of the present invention comprises from about 1 to about 99.89% by weight of a cosmetically acceptable carrier. The term
5 "cosmetically acceptable carrier" as used herein means components contained in the composition other than the silanol-terminated copolymer and the ester of dimethicone copolyol, which are generally used in cosmetic compositions within the scope of the present invention. Such cosmetic compositions may include, but are not limited to conditioners, hair
10 treatment creams, styling gels, mousse, pump hair sprays, aerosol hair sprays and foams, set lotions, blow styling lotions, hair color lotions, hair relaxing compositions, permanent wave first agents, and permanent wave second agents.

Specifically, cosmetically acceptable carriers, as defined herein,
15 include, but are not limited to, water, aqueous solutions, detergents, emollients, surfactants, pH adjusters, foam boosters, thickeners, fatty esters, ethers, alcohols, polymers, preservatives, colors, dyes, fragrances, mixtures thereof and other ingredients known to those skilled in the art.

The preferred cosmetically acceptable carriers include surfactants,
20 panthenol, panthenyl ethyl ether, fragrances, preservatives, wheat amino acids, and phytantriol.

This invention also contemplates a method of protecting the hair from heating comprising the step of contacting hair with the heat care composition embodiments disclosed above.

25 Many features of the invention will become apparent in the course of the following description of the exemplary embodiments, which are given for illustration of the invention and are not intended to be limiting thereof.

EXAMPLE 1

30 Hair Care Composition Evaluation

This example is an evaluation of a hair sample with the hair care composition of the present invention. The hair care composition contains

both an ester of dimethicone copolyol (dimethicone copolyol meadowfoamate) and a silanol-terminated copolymer (hydrolyzed wheat protein hydroxypropyl polysiloxane). A preferred embodiment of the present invention is showed in Table 1 below.

5

Table 1

Ingredient	Weight %
Dimethicone Co-copolyol Meadowfoamate	1.5
Hydrolyzed Wheat Protein Hydroxypropyl Polysiloxane	0.5
Panthenyl Ethyl Ether	0.5
Panthenol-DL	0.5
2-Phenoxyethanol	0.5
PPG-%-Ceteth-20	0.4
Sodium Dioctyl Sulfosuccinate	0.4
Methylparaben	0.3
Tetrasodium EDTA	0.2
Posh TD17707 (Fragrance)	0.1
Phosphoric Acid	0.7
Phytantriol	0.001
Wheat Amino Acids	0.001
Water	Balance

The method used in this evaluation consists of applying 20 cycles of 10 sec. of blow drying and 5 sec. of wetting hair fibers. The fibers were from a subject whose hair had not been treated chemically before. The hair fibers were approximately 80 microns in diameter and 2.5. inches long cut close to the root. The fibers were cut into three snippets. The first snippet was used to verify absence of cracks in the virgin hair fibers before blow drying, the second snippet was blow dried using a control of de-ionized (DI) water as the wetting solution, and the third snippet was also blow dried using the hair care composition of Table 1. A commercial blow drier capable of reaching temperatures between 75 and 85°C was used.

The hair snippets were held tightly on a glass slide so as to avoid fiber movement during blow drying.

The blow drier nozzle was placed in such a way that the air temperature reaching the hair surface was about 75°C, i.e. approximately a distance of 2.5 inches from the hair surface to the blow drier nozzle. The hot air at this temperature was blown on the hair for about 10 seconds. Subsequently, the hair fiber was immersed either in DI-water or in the hair lotion under test at 25°C for about 5 seconds. While the fiber was still wet, hot air was blown on it starting a new cycle again. This blow drying/wetting process constitutes one thermal cycle; 20 of these cycles were applied to each fiber. After the 20 cycles, the fibers were analyzed by SEM. The number of cuticle cracks per unit area on each tested hair were counted and averages were calculated. A comparison between virgin, control, and treated samples was made and the results are shown in Table 2 below.

Table 2

Hair Conditioning	Number of Cracks /mm ²
Virgin Hair (No heat treatment)	5 ± 0.2
DI Water (control)	283 ± 18
Hair Care Composition (Table 1)	6 ± 1

The results show that there is a significant improvement in the number of cracks per unit area with hair treated with the hair care composition as compared to the DI water control. The heat treated hair that was contacted with the hair care composition showed results that were comparable to virgin hair.

The invention having been thus described with particular reference to the preferred forms thereof, it will be obvious that various changes and modifications may be made therein without departing from the spirit and scope of the invention as defined in the appended claims.

What is claimed is:

1. A hair care composition comprising:
 - (i) an ester of dimethicone copolyol;
 - 5 (ii) a silanol-terminated copolymer; and
 - (iii) a cosmetically acceptable carrier.
2. The composition of claim 1 wherein said silanol-terminated copolymer is a silanol-terminated polypeptide copolymer.
- 10 3. The composition of claim 2 wherein said polypeptide is derived from compounds selected from the group consisting of: keratin, soy, milk, collagen, and wheat proteins.
- 15 4. The composition of claim 3 wherein said silanol-terminated copolymer further comprises a siloxane cross-linked copolymer.
5. The composition of claim 4 wherein said polypeptide chain is derived from wheat proteins.
- 20 6. The composition of claim 5 wherein said silanol-terminated copolymer is hydrolyzed wheat protein hydroxypropyl polysiloxane.
7. The composition of claim 1 wherein said ester of dimethicone
25 copolyol is selected from the group consisting of: dimethicone copolyol behenate, dimethicone copolyol almondate, dimethicone copolyol avocadoate, dimethicone copolyol beeswax, dimethicone copolyol borageate, dimethicone copolyol cocoa butterate, dimethicone copolyol dhupa butterate, dimethicone copolyol hydroxysterate, dimethicone
30 copolyol isosterate, dimethicone copolyol kokum butterate, dimethicone copolyol laurate, dimethicone copolyol mango butterate, dimethicone copolyol meadowfoamate, dimethicone copolyol mohwa butterate,

dimethicone copolyol octyl dodecyl citrate, dimethicone copolyol olivate, dimethicone copolyol sal butterate, dimethicone copolyol shea butterate, and dimethicone copolyol stearate.

5 8. The composition of claim 1 wherein said ester of dimethicone copolyol is dimethicone copolyol meadowfoamate.

 9. The composition of claim 6 wherein said ester of dimethicone copolyol is dimethicone copolyol meadowfoamate.

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 10. The composition of claim 1 wherein said cosmetically acceptable carrier comprises water.

 11. The composition of claim 10 wherein said cosmetically
15 acceptable carrier further comprises other additives selected from the group consisting of: surfactants, panthenol, panthenyl ethyl ether, fragrances, preservatives, wheat amino acids and phytantriol.

 12. The composition of claim 1 wherein said ester of dimethicone
20 copolyol is present in an amount of from about 0.1% to about 5%; said silanol-terminated copolymer is present in an amount of from about 0.01 to about 5% and said cosmetically acceptable carrier is present in an amount of from about 1% to about 99.89%, based on the total weight of the composition.

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 13. The composition of claim 9 wherein said ester of dimethicone copolyol is present in an amount of from about 0.1% to about 5%; said silanol-terminated copolymer is present in an amount of from about 0.01 to about 5% and said cosmetically acceptable carrier is present in an amount
30 of from about 1% to about 99.89%, based on the total weight of the composition.

14. A method of protecting hair from heat comprising the steps of contacting hair with a hair care composition, wherein said hair care composition comprises

- (i) an ester of dimethicone copolyol;
- 5 (ii) a silanol-terminated copolymer; and
- (iii) a cosmetically acceptable carrier.

15. The method of claim 14 wherein said silanol-terminated copolymer is hydrolyzed wheat protein hydroxypropyl polysiloxane.

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16. The method of claim 14 wherein said ester of dimethicone copolyol is dimethicone copolyol meadowfoamate.

17. The method of claim 15 wherein said ester of dimethicone
15 copolyol is dimethicone copolyol meadowfoamate.

18. The method of claim 14 wherein said ester of dimethicone copolyol is present in an amount of from about 0.1% to about 5%; said silanol-terminated copolymer is present in an amount of from about 0.01 to
20 about 5% and said cosmetically acceptable carrier is present in an amount of from about 1% to about 99.5%, based on the total weight of the composition.

19. The method of claim 17 wherein said ester of dimethicone
25 copolyol is present in an amount of from about 0.1% to about 5%; said silanol-terminated copolymer is present in an amount of from about 0.01 to about 5% and said cosmetically acceptable carrier is present in an amount of from about 1% to about 99.5%, based on the total weight of the composition.

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/US99/29450

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) :A61K 7/06, 7/075

US CL :510/122, 126, 466, 475; 424/70.11, 70.12, 70.122, 70.14; 134/42

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 510/122, 126, 466, 475; 424/70.11, 70.12, 70.122, 70.14; 134/42

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
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WEST**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5,527,530 A (SIMMONS et al) 18 June 1996, col. 3, lines 18-45, col. 4, lines 17-55, col. 6, line 20-col. 8, line 10.	1-19
Y	CRODA INC., Crodasone W Product Literature, 8 March 1995, pages 1-5, especially page 1.	1-6, 12-15, 18-19
X, P	US 5,993,792 A (RATH et al) 30 November 1999, col. 5, line 24-col. 6, line 24, col. 9, lines 24-43, col. 17, line 20-col. 19, line 7.	1-19
A	EP 0,540,357 A2 (JONES et al) 05 May 1993, see entire document.	1-6, 12-15, 18-19

☐ Further documents are listed in the continuation of Box C.☐ See patent family annex.

* Special categories of cited documents:	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
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Authorized officer

BRIAN MRUK

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